Local Government Energy Audit:
Energy Audit Report

Abbott and Costello Center

1 Normal Ave

Montclair, NJ 07043

Montclair State University

May 31, 2018

Final Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Abbott and Costello Center.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey higher education facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Abbott and Costello Center is a 7,347 square foot police sub-station, constructed in 2003, which consists of various space types such as office spaces, holding cell, corridors, file room, and lobbies.

Lighting at Abbott and Costello Center primarily consists of a combination of 32-Watt T8 fluorescent fixtures and compact fluorescent lamps (CFL). In addition to the fluorescent fixtures, all the exit light fixtures are LED based systems. Exterior lighting is provided by high intensity discharge (HID) based fixtures. Lighting control is provided by switches at interior spaces and by photocell for the exterior fixtures.

Cooling is provided by three split systems having capacities between 3 tons and 12.5 tons. Heating at the facility is provided by a 211 MBH natural gas fired heating hot water boiler.

Electricity and natural gas are supplied to the building by PSE&G. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated seven measures including five measures which together represent an opportunity for Abbott and Costello Center to reduce annual energy costs by $2,643 and annual greenhouse gas emissions by 20,082 lbs CO_2e. We estimate that if all high priority measures are implemented as recommended, the project will pay for itself in 4.2 years. TRC has defined high priority measures as the evaluated measures that have a simple payback less than the typical equipment life of the proposed equipment. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Abbott and Costello Center's annual energy use by 8%.

Figure 1 – Previous 12 Month Utility Costs

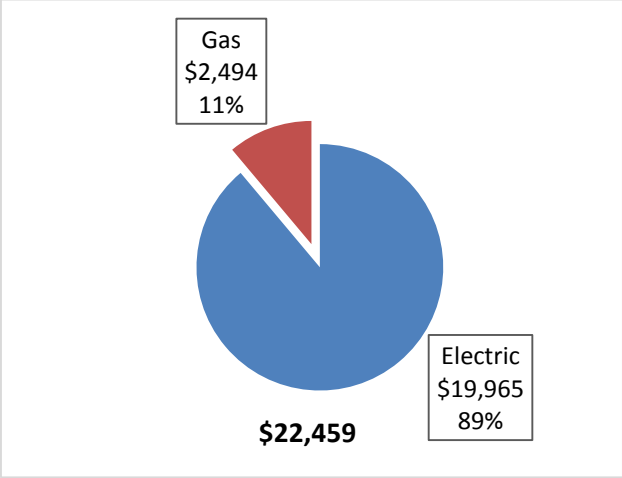
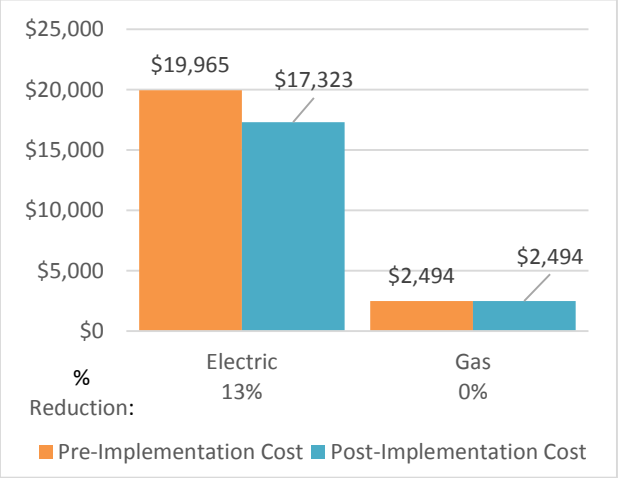


Figure 2 – Potential Post-Implementation Costs



A detailed description of Abbott and Costello Center's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the evaluated energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		High Priority?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**15,651**	**2.4**	**0.0**	**$2,074.03**	**$9,238.60**	**$885.00**	**$8,353.60**	**4.0**	**15,760**
ECM 1	Install LED Fixtures	Yes	1,314	0.2	0.0	$174.13	$2,249.10	$15.00	$2,234.10	12.8	1,323
ECM 2	Retrofit Fixtures with LED Lamps	Yes	14,337	2.2	0.0	$1,899.90	$6,989.50	$870.00	$6,119.50	3.2	14,437
Lighting Control Measures			**2,338**	**0.4**	**0.0**	**$309.78**	**$2,560.00**	**$210.00**	**$2,350.00**	**7.6**	**2,354**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	1,880	0.3	0.0	$249.18	$2,160.00	$210.00	$1,950.00	7.8	1,893
ECM 4	Install High/Low Lighitng Controls	Yes	457	0.1	0.0	$60.60	$400.00	$0.00	$400.00	6.6	460
Electric Unitary HVAC Measures			**5,444**	**2.9**	**0.0**	**$721.39**	**$24,223.54**	**$1,585.50**	**$22,638.04**	**31.4**	**5,482**
	Install High Efficiency Electric AC	No	5,444	2.9	0.0	$721.39	$24,223.54	$1,585.50	$22,638.04	31.4	5,482
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**28.1**	**$231.71**	**$8,258.54**	**$1,000.00**	**$7,258.54**	**31.3**	**3,293**
	Install High Efficiency Hot Water Boilers	No	0	0.0	28.1	$231.71	$8,258.54	$1,000.00	$7,258.54	31.3	3,293
Plug Load Equipment Control - Vending Machine			**1,954**	**0.0**	**0.0**	**$258.99**	**$460.00**	**$0.00**	**$460.00**	**1.8**	**1,968**
ECM 5	Vending Machine Control	Yes	1,954	0.0	0.0	$258.99	$460.00	$0.00	$460.00	1.8	1,968
TOTALS FOR HIGH PRIORITY MEASURES			**19,943**	**2.8**	**0.0**	**$2,642.80**	**$12,258.60**	**$1,095.00**	**$11,163.60**	**4.2**	**20,082**
TOTALS FOR ALL EVALUATED MEASURES			**25,386**	**5.7**	**28.1**	**$3,595.90**	**$44,740.68**	**$3,680.50**	**$41,060.18**	**11.4**	**28,857**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

Gas Heating (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer efficiency.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

Energy Efficient Practices

TRC also identified 14 low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Abbott and Costello Center include:

- Reduce Air Leakage
- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Abbott and Costello Center. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Direct Install
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Ana Pinto	Director of Energy Management	pintoa@mail.montclair.edu	973-655-3244
Kevin Johnson	Supervisor of Building Repairs	johnsonke@mail.montclair.edu	973-655-4505
TRC Energy Services			
Moussa Traore	Auditor	MTraore@trcsolutions.com	732-855-0033

2.2 General Site Information

On July 7, 2017, TRC performed an energy audit at Abbott and Costello Center located in Montclair, New Jersey. TRC's team met with Ana Pinto to review the facility operations and help focus our investigation on specific energy-using systems.

Abbott and Costello Center is a 7,347 square foot police sub-station, constructed in 2003, which consists of various space types such as office spaces, holding cell, corridors, file room, and lobbies.

Lighting at Abbott and Costello Center primarily consists of a combination of 32-Watt T8 fluorescent fixtures and compact fluorescent lamps (CFL). In addition to the fluorescent fixtures, all the exit light fixtures are LED based systems. Exterior lighting is provided by high intensity discharge (HID) based fixtures. Lighting control is provided by switches at interior spaces and by photocell for the exterior fixtures.

Cooling is provided by three split systems having capacities between 3 tons and 12.5 tons. Heating at the facility is provided by a 211 MBH natural gas fired heating hot water boiler.

Electricity and natural gas are supplied to the building by PSE&G.

2.3 Building Occupancy

The building is open continuously to provide for campus safety and security. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Abbott and Costello Center	Weekday	12 AM - 12 AM
Abbott and Costello Center	Weekend	12 AM - 12 AM

2.4 Building Envelope

The Abbott and Costello Center is constructed from concrete masonry with exterior finish and double pane tinted windows with fixed frames. The sloped roof is constructed of tile roofing material.

Figure 6 – Building Façade

Building envelope measures generally consist of improving the following aspects of the walls, roofs, windows and in some cases floor or foundation:

- Increase resistance to heat transfer by improving the insulation quality.
- Reduce the loss of conditioned air or introduction of outside air by sealing the components of the envelope.
- Reduce heat gain be improving the reflectance of components of the envelope.

Quantifying the savings associated with implementing these changes is difficult primarily due to the transient nature of the energy use and because the savings do not occur at the envelope components but rather at the supporting heating, air conditioning and ventilation systems. In addition, most building envelope measures are expensive to implement and as a result have long paybacks.

Although this energy audit did not identify any envelope specific issues related to any of the Montclair University buildings the following should be included during the normal facility maintenance and planning.

A cost effective alternative to address some envelope issues is known as weatherization, which generally involves sealing cracks and gaps around windows, doors, and wall and roof penetrations. Weatherization measures are typically inexpensive, can be done by on-site staff, result in relatively low energy savings, and can improve occupant comfort by reducing drafts and hot/cold spots. Maintaining caulking and weather stripping are almost always cost effective and should be part of the on-going maintenance program.

Installing window film can be one of the relatively less expensive envelope measures. Window films can be successful when installed correctly and in the right application. Window film generally reduces solar heat gain by restricting the transmittance of specific parts of the solar spectrum. In some cases solar film can also increase the overall R-value of the window resulting in reduced heat loss. Some window films will also reduce the light transmittance which can cause the interior space to be darker. Two factors that make a good application for window film are cooling dominant buildings and buildings with clear, single

pane windows. Buildings orientations that are significantly shaded are generally not a good application for window film. The installed cost for window film can range from $5 to $20 per square foot of window depending on the quality of the film, the size of the job, and arrangement of the windows.

Most other improvements to the building envelope only become cost effective when done in conjunction with other renovations. The most common example is increasing the insulation value of a roof or installing a "cool-roof" as part of an overall roof replacement project.

2.5 On-Site Generation

Abbott and Costello Center does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

Lighting at Abbott and Costello Center primarily consists of a combination of 32-Watt T8 fluorescent fixtures and compact fluorescent lamps (CFL). T8 Fluorescent fixtures generally have 2-lamp configurations whereas CFL fixtures have 1-lamp and 2-lamp configurations. All the T8 fixtures are 4-foot in length. The CFLs are 26-Watt lamps. In addition to the fluorescent fixtures, all the exit light fixtures are LED based systems.

Lighting control in all interior spaces is provided by manual switches with exit signs operating 24 hours a day for security reasons.

The building's exterior lighting consists of 150-Watt fixtures. All the exterior fixtures are controlled to operate from dusk to dawn.

Figure 7 - Building Lighting Systems

Compact Fluorescent Fixture	*Exterior Fixtures*
	

Hot Water Heating System

The hot water system consists of one Peerless 211 kBtu/hr output, hot water boiler. The boiler has a nominal combustion efficiency of 81%. The boiler is configured in a constant flow primary distribution with one 5 hp hot water pump operating at constant speed. The boiler provides hot water to five air handlers for heating.

Figure 8 - Building Heating Systems

Hot Water Boiler	*Hot Water Pump*
	

Direct Expansion Air Conditioning System (DX)

The facility also has three direct expansion air conditioning systems that are split systems. The sizes of split systems range between 3.0 tons and 12.5 tons. The efficiency of the units range between 9.8 and 10.45 EER.

Figure 9 – DX Air Conditioning Systems

Air Handling Systems (HW Based)

The facility has five hot water based air handling units. The units provide hot air to the building spaces through hot water coils. Each air handling unit has a 1 hp supply fan operating at constant speed.

Figure 10 – Air Handling Unit

Building Energy Management System (BEMS)

Building systems are controlled through an Alerton Energy Management System (EMS). The BEMS is capable of providing control and programming of scheduling, temperature resets, trending, and other advanced sequences.

Figure 11 – Building Energy Management System Controller

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one A.O. Smith domestic gas fired hot water heater with an input rating of 180 kBtu/hr and a nominal efficiency of 81%. The water heater has an 81 gallon storage tank. One 1.5 hp recirculation pump distributes water to the entire site and also the pool area.

Building Plug Load

There are roughly 10 computer work stations throughout the facility. All the computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

There are other plug load systems such as printers, copiers, microwaves, and televisions at the facility. In addition to the typical plug load equipment, the facility also has one refrigerated and one non-refrigerated vending machine.

2.7 Water-Using Systems

This building also includes a swimming pool that is operational throughout the year.

Figure 12 – Swimming Pool

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

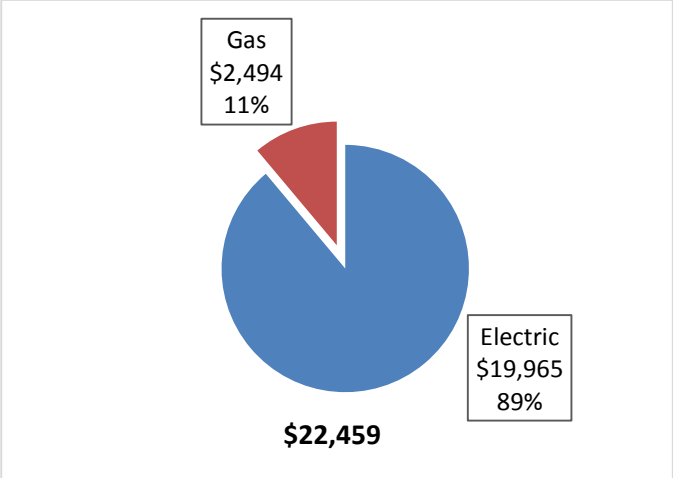
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 13 - Utility Summary

Utility Summary for Abbott and Costello Center		
Fuel	**Usage**	**Cost**
Electricity	150,661 kWh	$19,965
Natural Gas	3,027 Therms	$2,494
Total		**$22,459**

The current annual energy cost for this facility is $22,459 as shown in the chart below.

Figure 14 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.133/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Based on the graph below, electricity use spikes during the summer months due to high cooling loads which results in extensive operation of cooling equipment.

Figure 15 - Electric Usage & Demand

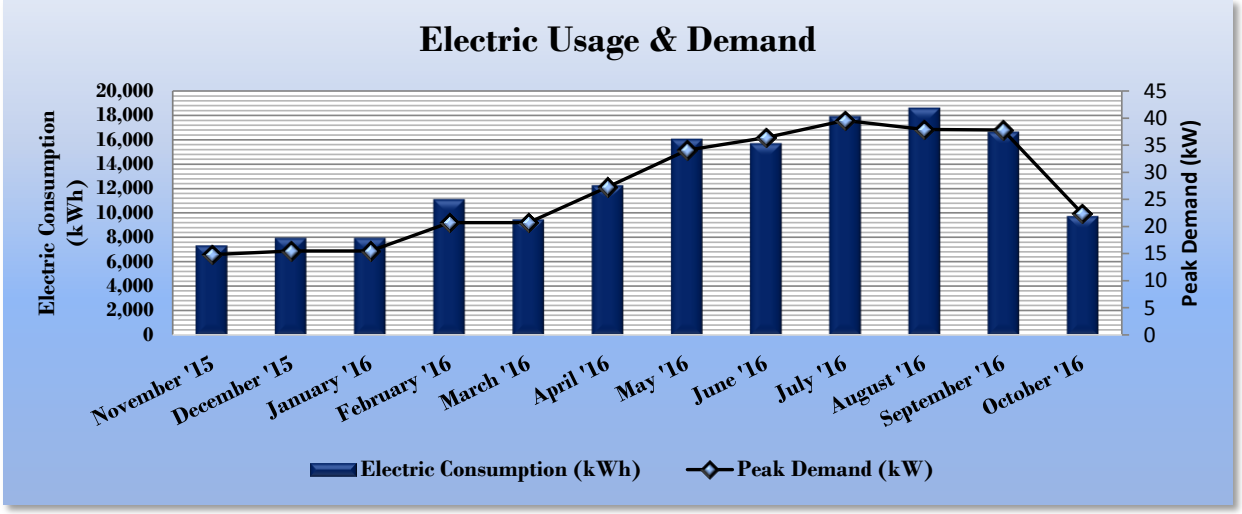


Figure 16 - Electric Usage & Demand

Electric Billing Data for Abbott and Costello Center						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
12/4/15	31	7,329	14.8	$363	$1,007	No
1/6/16	33	7,971	15.5	$236	$1,064	No
2/5/16	30	7,971	15.5	$236	$1,064	Yes
3/7/16	31	11,113	20.7	$422	$1,379	No
4/6/16	30	9,459	20.7	$442	$1,267	No
5/5/16	29	12,245	27.3	$471	$1,518	No
6/6/16	32	16,039	34.1	$790	$2,216	No
7/6/16	30	15,685	36.4	$898	$2,323	No
8/4/16	29	17,880	39.6	$926	$2,514	No
9/2/16	29	18,591	37.9	$917	$2,503	No
10/4/16	32	16,632	37.8	$609	$1,870	No
11/2/16	29	9,746	22.4	$539	$1,241	No
Totals	**365**	**150,661**	**39.6**	**$6,850**	**$19,965**	
Annual	**365**	**150,661**	**39.6**	**$6,850**	**$19,965**	

3.3 Natural Gas Usage

Natural Gas is provided by PSE&G. The average gas cost for the past 12 months is $0.824/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Based on the graph below, gas use spikes during the winter months due to high heating loads which results in extensive operation of boilers and heating equipment.

Figure 17 - Natural Gas Usage

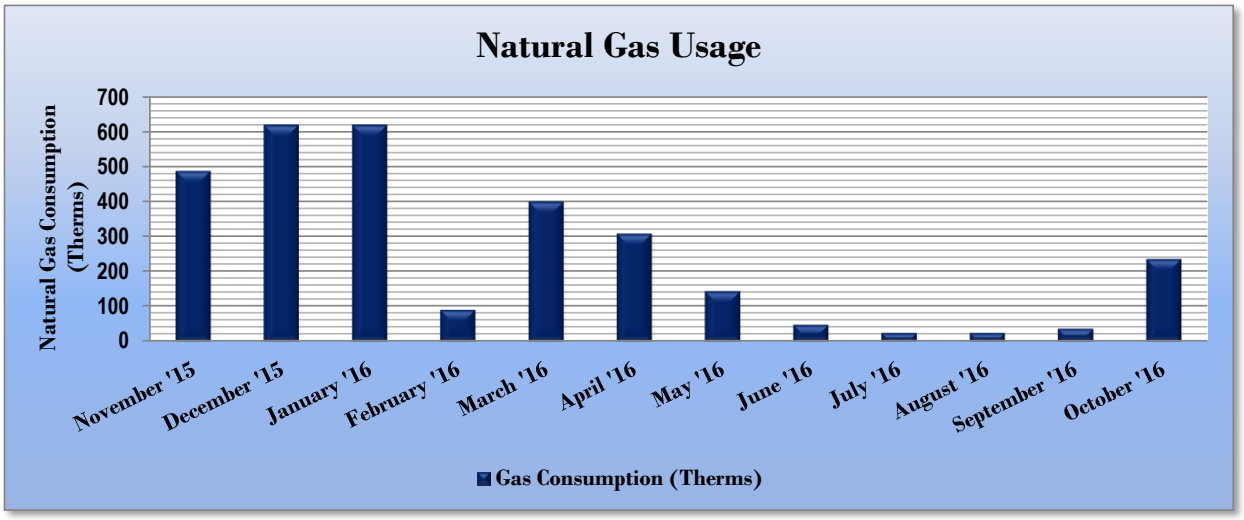


Figure 18 - Natural Gas Usage

Gas Billing Data for Abbott and Costello Center			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
12/4/15	31	486	$382
1/6/16	33	618	$504
2/5/16	30	618	$504
3/7/16	31	90	$77
4/6/16	30	399	$294
5/5/16	29	307	$234
6/6/16	32	143	$116
7/6/16	30	47	$47
8/4/16	29	24	$32
9/2/16	29	24	$31
10/4/16	32	36	$42
11/2/16	29	235	$230
Totals	**365**	**3,027**	**$2,494**
Annual	**365**	**3,027**	**$2,494**

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 19 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Abbott and Costello Center	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	263.0	262.6
Site Energy Use Intensity (kBtu/ft^2)	111.2	130.7

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

Figure 20 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Abbott and Costello Center	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	233.9	262.6
Site Energy Use Intensity (kBtu/ft^2)	101.9	130.7

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Your building is one of the building categories that are not eligible to receive a score.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

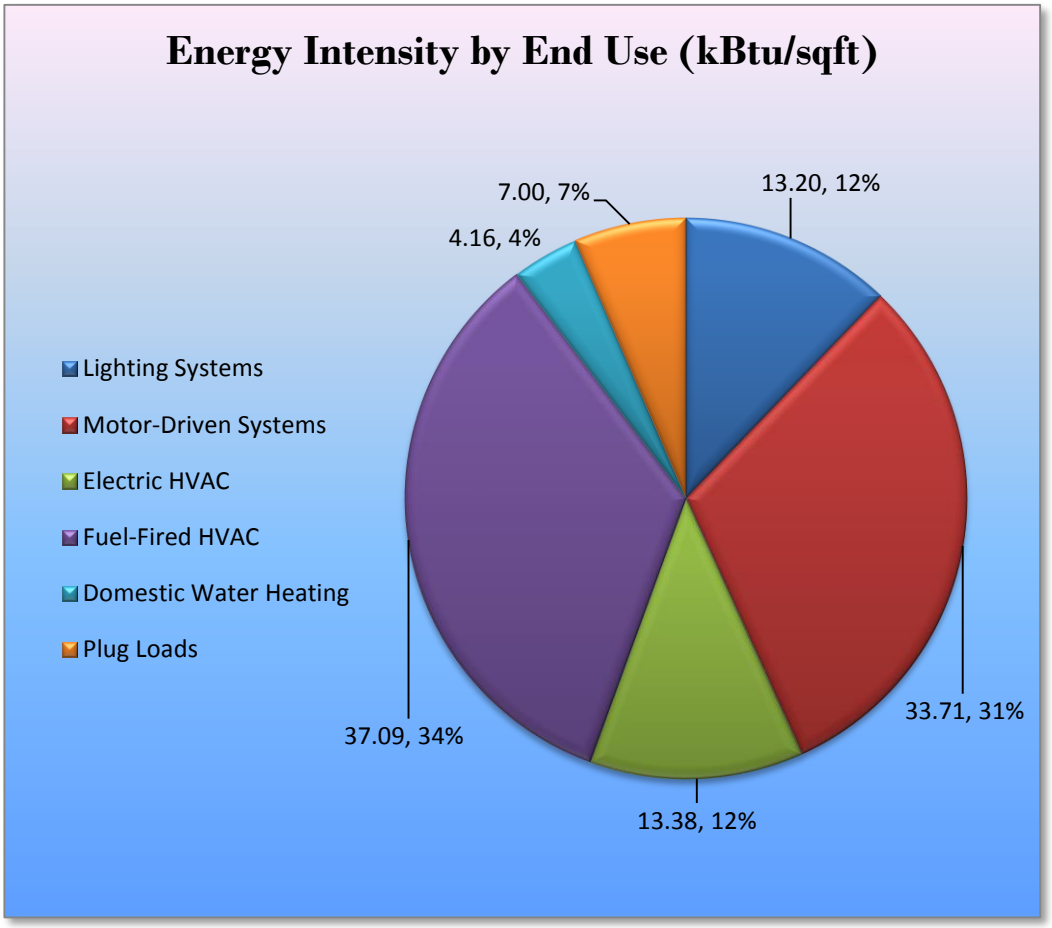
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 21 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Abbott and Costello Center regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 High Priority ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 22 – Summary of High Priority ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**15,651**	**2.4**	**0.0**	**$2,074.03**	**$9,238.60**	**$885.00**	**$8,353.60**	**4.0**	**15,760**
ECM 1	Install LED Fixtures	1,314	0.2	0.0	$174.13	$2,249.10	$15.00	$2,234.10	12.8	1,323
ECM 2	Retrofit Fixtures with LED Lamps	14,337	2.2	0.0	$1,899.90	$6,989.50	$870.00	$6,119.50	3.2	14,437
Lighting Control Measures		**2,338**	**0.4**	**0.0**	**$309.78**	**$2,560.00**	**$210.00**	**$2,350.00**	**7.6**	**2,354**
ECM 3	Install Occupancy Sensor Lighting Controls	1,880	0.3	0.0	$249.18	$2,160.00	$210.00	$1,950.00	7.8	1,893
ECM 4	Install High/Low Lighitng Controls	457	0.1	0.0	$60.60	$400.00	$0.00	$400.00	6.6	460
Plug Load Equipment Control - Vending Machine		**1,954**	**0.0**	**0.0**	**$258.99**	**$460.00**	**$0.00**	**$460.00**	**1.8**	**1,968**
ECM 5	Vending Machine Control	1,954	0.0	0.0	$258.99	$460.00	$0.00	$460.00	1.8	1,968
TOTALS		**19,943**	**2.8**	**0.0**	**$2,642.80**	**$12,258.60**	**$1,095.00**	**$11,163.60**	**4.2**	**20,082**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Our recommended upgrades to existing lighting fixtures are summarized in Figure 23 below.

Figure 23 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**15,651**	**2.4**	**0.0**	**$2,074.03**	**$9,238.60**	**$885.00**	**$8,353.60**	**4.0**	**15,760**
ECM 1	Install LED Fixtures	1,314	0.2	0.0	$174.13	$2,249.10	$15.00	$2,234.10	12.8	1,323
ECM 2	Retrofit Fixtures with LED Lamps	14,337	2.2	0.0	$1,899.90	$6,989.50	$870.00	$6,119.50	3.2	14,437

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	1,314	0.2	0.0	$174.13	$2,249.10	$15.00	$2,234.10	12.8	1,323

Measure Description

We recommend replacing existing fixtures containing HID lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of HID lamps.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	13,916	2.2	0.0	$1,844.18	$6,689.50	$870.00	$5,819.50	3.2	14,014
Exterior	420	0.1	0.0	$55.72	$300.00	$0.00	$300.00	5.4	423

Measure Description

We recommend retrofitting existing linear fluorescent and compact fluorescent lighting technologies with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes.

4.1.2 Lighting Control Measures

Our recommended lighting control measures are summarized in Figure 24 below.

Figure 24 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**2,338**	**0.4**	**0.0**	**$309.78**	**$2,560.00**	**$210.00**	**$2,350.00**	**7.6**	**2,354**
ECM 3	Install Occupancy Sensor Lighting Controls	1,880	0.3	0.0	$249.18	$2,160.00	$210.00	$1,950.00	7.8	1,893
ECM 4	Install High/Low Lighitng Controls	457	0.1	0.0	$60.60	$400.00	$0.00	$400.00	6.6	460

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,880	0.3	0.0	$249.18	$2,160.00	$210.00	$1,950.00	7.8	1,893

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all file rooms, lobby, offices areas, etc. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces.

ECM 4: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
457	0.1	0.0	$60.60	$400.00	$0.00	$400.00	6.6	460

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are stairwells and corridors.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time. Energy savings results from only providing full lighting levels when it is required.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches.

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.1.3 Plug Load Equipment Control - Vending Machines

Our recommended plug load equipment control measures are summarized in Figure 25 below.

Figure 25 – Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	*Annual Natural Gas Savings (MMBtu)*	*Annual N/A Savings (MMBtu)*	*Annual N/A Savings (MMBtu)*	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		1,954	1,954	0	0.0	0.0	0.0	0.0	0.0	$258.99	$460.00	$0.00	$460.00	1.8	1,968
ECM 5	Vending Machine Control	1,954	1,954	0	0.0	0.0	0.0	0.0	0.0	$258.99	$460.00	$0.00	$460.00	1.8	1,968

ECM 5: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,954	0.0	0.0	$258.99	$460.00	$0.00	$460.00	1.8	1,968

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

4.2 Other Evaluated ECMs

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 26 – Summary of Other Evaluated ECMs

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**5,444**	**2.9**	**0.0**	**$721.39**	**$24,223.54**	**$1,585.50**	**$22,638.04**	**31.4**	**5,482**
Install High Efficiency Electric AC	5,444	2.9	0.0	$721.39	$24,223.54	$1,585.50	$22,638.04	31.4	5,482
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**28.1**	**$231.71**	**$8,258.54**	**$1,000.00**	**$7,258.54**	**31.3**	**3,293**
Install High Efficiency Hot Water Boilers	0	0.0	28.1	$231.71	$8,258.54	$1,000.00	$7,258.54	31.3	3,293
TOTALS	**5,444**	**2.9**	**28.1**	**$953.10**	**$32,482.08**	**$2,585.50**	**$29,896.58**	**31.4**	**8,775**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,444	2.9	0.0	$721.39	$24,223.54	$1,585.50	$22,638.04	31.4	5,482

Measure Description

We typically recommend replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units when cost effective. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Reasons for not Recommending

This measure was evaluated, however, is not recommended because of the long payback period. The payback exceeds the expected useful life of the proposed equipment.

Install High Efficiency Hot Water Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	28.1	$231.71	$8,258.54	$1,000.00	$7,258.54	31.3	3,293

Measure Description

We typically recommend replacing older inefficient hot water boilers with high efficiency hot water boilers when cost effective. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, condensing hydronic boilers were only evaluated when the return water temperature is less than 130°F during most of the operating hours.

Reasons for not Recommending

This measure was evaluated, however, is not recommended because of the long payback period. The payback exceeds the expected useful life of the proposed equipment.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5% to 25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gallons per minute (gpm) for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the campus' electric demand and the size and location of free areas on campus was performed and is addressed in the campus level summary report.

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

The campus has a CHP plant that uses natural gas fired turbines to generate electricity. Waste heat from the turbines is used to produce steam which is either delivered to buildings on campus or used to produce chilled water which is delivered to buildings on campus. Since the campus has a CHP that serves a significant portion of the campus further evaluation of individual building CHP applications were not done.

7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

In our opinion this building is not is a good candidate for DR.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 27 for a list of the eligible programs identified for each recommended ECM.

Figure 27 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	Direct Install
ECM 1	Install LED Fixtures	X	X
ECM 2	Retrofit Fixtures with LED Lamps	X	X
ECM 3	Install Occupancy Sensor Lighting Controls	X	X
ECM 4	Install High/Low Lighitng Controls		X
ECM 5	Vending Machine Control		X

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB.

8.2 Direct Install

Overview

Direct Install is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the Direct Install program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since Direct Install offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI.

8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
File Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	11	3,066	0.10	714	0.0	$94.55	$445.50	$65.00	4.02
Kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.02	166	0.0	$22.03	$58.50	$10.00	2.20
Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,066	0.18	1,260	0.0	$167.01	$621.00	$95.00	3.15
Locker Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.05	332	0.0	$44.05	$117.00	$20.00	2.20
Holding Cell	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.05	332	0.0	$44.05	$117.00	$20.00	2.20
Corridor	5	Compact Fluorescent: CFL - 2-Pin - 1L - 26-Watt	Wall Switch	26	4,380	Relamp	No	5	LED Screw-In Lamps: LED - 10 Watts Lamp 2-Pin	Wall Switch	10	4,380	0.06	403	0.0	$53.40	$250.00	$0.00	4.68
Main Lobby	10	Compact Fluorescent: CFL - 2-Pin - 1L - 26-Watt	Wall Switch	26	4,380	Relamp	Yes	10	LED Screw-In Lamps: LED - 10 Watts Lamp 2-Pin	Occupancy Sensor	10	3,066	0.14	957	0.0	$126.82	$770.00	$0.00	6.07
Main Lobby	4	Compact Fluorescent: CFL - 2-Pin - 2L - 52-Watt	Wall Switch	52	4,380	Relamp	Yes	4	LED Screw-In Lamps: LED - 10 Watts Lamp 2-Pin	Occupancy Sensor	20	3,066	0.11	766	0.0	$101.46	$670.00	$0.00	6.60
Elevator Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	365	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	365	0.02	14	0.0	$1.84	$58.50	$10.00	26.42
Mech Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,460	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,460	0.02	55	0.0	$7.34	$58.50	$10.00	6.61
Corridor 1st Floor	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,066	0.18	1,260	0.0	$167.01	$551.00	$60.00	2.94
Corridor 1st Floor	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pump Rm	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,190	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,533	0.18	630	0.0	$83.50	$621.00	$95.00	6.30
Electrical Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.05	332	0.0	$44.05	$117.00	$20.00	2.20
Fire Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.07	499	0.0	$66.08	$175.50	$30.00	2.20
Data Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,066	0.09	630	0.0	$83.50	$445.50	$65.00	4.56
Corridor 2nd Floor	5	Compact Fluorescent: CFL - 2-Pin - 1L - 26-Watt	Wall Switch	26	4,380	Relamp	No	5	LED Screw-In Lamps: LED - 10 Watts Lamp 2-Pin	Wall Switch	10	4,380	0.06	403	0.0	$53.40	$250.00	$0.00	4.68
Corridor 2nd Floor	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Break Rm	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,066	0.46	3,151	0.0	$417.52	$1,147.50	$185.00	2.31
Break Rm	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.05	332	0.0	$44.05	$117.00	$20.00	2.20
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	365	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	365	0.02	14	0.0	$1.84	$58.50	$10.00	26.42
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	365	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	365	0.02	14	0.0	$1.84	$58.50	$10.00	26.42
Men's Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.05	332	0.0	$44.05	$117.00	$20.00	2.20
Women's Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.05	332	0.0	$44.05	$117.00	$20.00	2.20

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Office	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,066	0.46	3,151	0.0	$417.52	$1,147.50	$185.00	2.31
Office	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stairwell	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,066	0.18	1,260	0.0	$167.01	$551.00	$60.00	2.94
Office	8	Compact Fluorescent: CFL - 2-Pin - 1L - 8-Watt	Wall Switch	8	4,380	Relamp	No	8	LED Screw-In Lamps: LED - 6 Watts Lamp 2-Pin	Wall Switch	6	4,380	0.01	81	0.0	$10.68	$200.00	$0.00	18.73
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.05	332	0.0	$44.05	$117.00	$20.00	2.20
Mech Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.07	499	0.0	$66.08	$175.50	$30.00	2.20
Data Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.05	332	0.0	$44.05	$117.00	$20.00	2.20
Exterior Perimeter	3	Mercury Vapor: (1) 150W Lamp	DDC	150	4,380	Fixture Replacement	No	3	LED - Fixtures: Porch (Wall Mounted)	DDC	50	4,380	0.22	1,511	0.0	$200.25	$2,249.10	$15.00	11.16
Front Entrance	3	Compact Fluorescent: CFL - 4-Pin - 2L - 52-Watt	DDC	52	4,380	Relamp	No	3	LED Screw-In Lamps: LED - 10 Watts Lamp 2-Pin	DDC	20	4,380	0.07	484	0.0	$64.08	$300.00	$0.00	4.68

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Pump Room	Pool	1	Other	1.5	84.0%	No	5,110	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pump Room	Pump Room	1	Ventilation Fan	0.3	82.5%	No	5,110	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pump Room	Pool	1	Process Pump	5.0	85.9%	No	5,110	No	85.9%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Elevator Rm	Elevator Rm	1	Other	20.0	72.0%	No	1,095	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stairwell	Stairwell	4	Other	0.8	85.5%	No	8,760	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mech Rm	Abbott	5	Supply Fan	1.0	85.5%	No	4,380	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Ground Floor	Abbott	1	Split-System AC	3.00		Yes	1	Split-System AC	3.00		14.00		No	0.59	1,097	0.0	$145.33	$4,488.66	$276.00	28.99
Ground Floor	Abbott	1	Split-System AC	12.50		Yes	1	Split-System AC	12.50		11.50		No	1.52	2,841	0.0	$376.43	$14,498.11	$987.50	35.89
Ground Floor	Abbott	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	0.80	1,506	0.0	$199.64	$5,236.77	$322.00	24.62

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Abbott	Abbott	1	Non-Condensing Hot Water Boiler	211.00	Yes	1	Condensing Hot Water Boiler	211.00	93.00%	AFUE	0.00	0	28.1	$231.71	$8,258.54	$1,000.00	31.33

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room M01	Morehead Hall	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Abbott	3	Microwave	1,000.0	No
Abbott	2	Refrigerator	600.0	No
Abbott	3	Television	375.0	No
Abbott	2	Copier	515.0	No
Abbott	3	Printer	515.0	No
Abbott	10	Desktop and LCD Monitor	191.0	No
Abbott	2	Electric Range	1,200.0	No
Abbott	2	Coffee Maker	400.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lobby	1	Refrigerated	Yes	0.00	1,612	0.0	$213.60	$230.00	$0.00	1.08
Lobby	1	Non-Refrigerated	Yes	0.00	343	0.0	$45.39	$230.00	$0.00	5.07

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Abbott & Costello Center

Primary Property Type: Office
Gross Floor Area (ft²): 7,347
Built: 2003

For Year Ending: October 31, 2016
Date Generated: September 12, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Abbott & Costello Center 125 Clove Road Little Falls, New Jersey 07424	Montclair Statet University 1 Normal Avenue Montclair, NJ 07043 973-655-3244	Ana Pinto 1 Normal Avenue Montclair, NJ 07043 973-655-3244 pintoa@montclair.edu

Property ID: 6023397

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
108.5 kBtu/ft²

Source EUI
261.6 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	277,904 (35%)
Electric - Grid (kBtu)	519,230 (65%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	61.4
National Median Source EUI (kBtu/ft²)	148.1
% Diff from National Median Source EUI	77%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	72

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

___ _____

,

(___)___-_____

_____

Professional Engineer Stamp
(if applicable)